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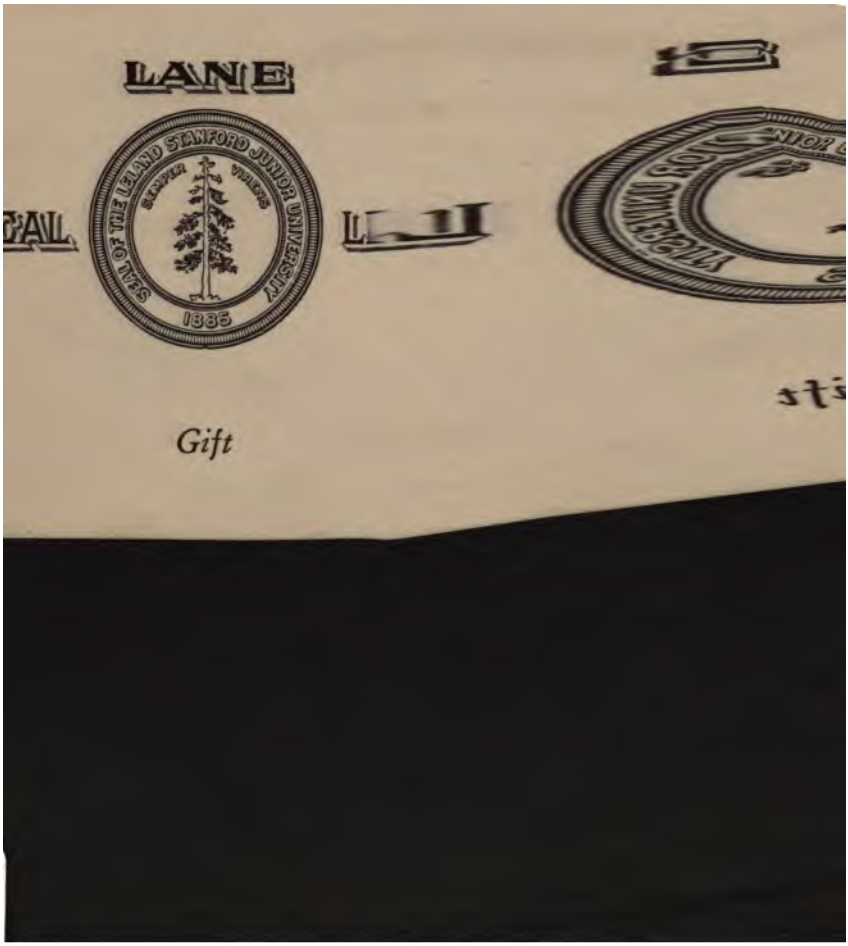
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LATERAL CURVATURE OF THE SPINE, STOOPING, AND THE DEVELOPMENT OF THE CHEST IN PHTHISIS

THE MANAGEMENT
OF
LATERAL CURVATURE OF THE SPINE, STOOPING,
AND
THE DEVELOPMENT OF THE CHEST IN PHTHISIS

BY

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1904

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PREFACE

IN the following pages I have endeavoured to describe in a clear and simple manner the practical points connected with the management of lateral and posterior curvature of the spine, and I have added a description of a method for developing the chest in phthisis.

In respect to lateral curvature and posterior curvature (stooping) I have discussed the advantages to be derived from scientifically-applied exercises, while I have also endeavoured to show that in a large number of these cases the use of a mechanical appliance is also advantageous.

There has long existed a strong prejudice against the use of spinal apparatus, but I trust I have conclusively shown that it is possible to have a simple splint which is free from the objectionable qualities appertaining to the old complicated instruments and cumbrous jackets.

In Chance's splint we have an invaluable help to treatment, constructed upon sound physiological principles, and designed by a surgeon of great mechanical genius.

The value of mechanically expanding the chest in phthisis, advocated years ago by Silvester, and effectually accomplished by the use of Chance's apparatus, would, I believe, long ago have been universally recognised by the medical profession had it not been for the prejudice which I have just referred to as existing against the use of spinal apparatus.

It will be found, however, that the continuous expansion of the thorax which the use of this apparatus produces will so improve the *vital capacity* of the individual that the air will enter the lungs in largely increased volume at each inspiration, and will penetrate into air-cells which have previously been collapsed, and that thereby the patient will be greatly benefited. I believe that there is a great future for this treatment of consumption, and that in combination with other remedies it will do much towards curing the disease.

QUEEN ANNE STREET,
LONDON, W.
November 1903.

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LATERAL CURVATURE OF THE SPINE, STOOPING,

AND

THE DEVELOPMENT OF THE CHEST IN PHTHISIS

CHAPTER I

INTRODUCTION

ONE might almost say that lateral curvature of the spine is a symptom rather than a disease, for it is the result of a great many different conditions. Yet when the deformity is once established the affection assumes, whatever may be its cause, so definite a character that it fairly claims the position of a distinct disorder. In dealing with lateral curvature, however, we must consider from a practical point of view the various steps which have led up to the deformity as we first see it, and we must not expect to be able to apply a specific kind of treatment which will meet the requirements of all cases alike.

In the present day there seems to be almost as great an inclination on the part of medical men to establish, as there is on the part of the public to accept, 'systems' of treatment for various kinds of disease. Thus we have the *light* treatment of lupus, the *open-air* treatment of phthisis, the *serum* treatment of diphtheria, and various other special methods of dealing with special morbid conditions. Every scientific medical man knows that such particular lines of treatment have a limited value, and that it is to the judicious combination or selection of various remedies that he must look for the best results in any particular class of cases. This being so, it stands to reason that in dealing with scoliosis, a disease which, as already stated, arises from a variety of causes, no special 'system' of treatment is applicable. Yet we find the 'exercise' treatment or the 'mechanical' treatment considered by certain persons as quite opposed the one to the other; while in truth we may combine these and other methods, or use each separately as may be required. These statements may seem to the reader but the record of very simple facts, or truisms, and yet they must be emphasised, because lateral curvature has been subjected to special systems of treatment perhaps more than any other surgical affection. These systems of treatment have

been to a great extent founded upon theories of causation. The general view at the present day is that the fault lies in the muscular system, and this fault is usually described as 'muscular weakness,' but no one has attempted to explain why the muscles of the back alone should be specially attacked in this way. A theory once very prevalent was that curvature was the result of unequal action of the muscles on the two sides of the spine. It was Delpech who, in the first half of the last century, advocated this theory very strongly, but Werner,[1] in 1851, 'demonstrated,' as Bauer maintains, that the 'muscular antagonism' theory was a gross error.

Lorinser[2] took quite another view, and advocated an old theory that the deformity originated in a 'softening, general infiltration, and osteoporosis of the vertebral bodies.' In these and other conflicting views we see attempts to evolve 'systems,' and it is probably fair to state that nearly all these observers were right and all were wrong. In other words, we may well believe that scoliosis depends upon a variety of causes. Even the extravagant view of Guérin[3] that the deformity was caused by muscular contrac-

[1] *Reform der Orthopaedie.* Berlin, 1851.

[2] *Wiener Med. Wochenschrift*, No. 22, 23, 24.

[3] *Sur le traitement des déviations de l'épine par la section des muscles du dos.* Paris, 1843.

tion cannot be quite set aside (as it was by a committee of the 'Académie des Sciences' in Paris in 1844), for do we not see lateral curvature produced by contraction of the sterno-mastoid muscle in torticollis, and from contraction of the adductors of a thigh? Such instances as these would, however, be described as *exceptional* by theoretical writers, but there are so many exceptions that they embrace almost the whole range of cases. We have inequality in length of legs; inequality in weight from loss of an arm; forced positions in trades and school work; contraction of a side from pleurisy, and many other special conditions. These, it may be said, are exciting causes, but they are so potent in their effects that they may produce deformity even when no predisposition exists. It is the predisposition, however, which most demands our consideration, for the counteracting of the exciting influences is comparatively easy. With regard to this aspect of the subject, probably no more enlightened views have been expressed than those of Buehring. Translated by Bauer,[1] Buehring attributes the chief predisposing cause to defective vitality, especially in girls at the age of puberty; 'a low state of hæmatosis . . .

[1] *Lectures on Orthopædic Surgery*, by Louis Bauer, New York, 1868.

anæmia . . . inefficient nutrition of the various structures of the body, depriving bones and cartilages of their usual firmness and elasticity and rendering them susceptible to an alteration of their respective forms.' . . . 'The softness of bone is therefore the simple result of a low state of nutrition, and not of any specific structural disease, as, for instance, rachitis, osteomalacia, osteitis, &c. Nor is the softness so great as to be affected by the weight of the body alone, though sufficient to give the spine an unusual degree of flexibility.'

My own experience with regard to a large number of cases is absolutely in accordance with these views of Buehring. Undoubtedly muscular weakness may exist as a result of such deficient vitality ; but we must not lose sight of the primary cause nor of the necessity of dealing with the weakened basis of support, the skeleton, while we are attempting to develop the strength of the active agents in movement—the muscles.

CHAPTER II

TREATMENT

REMOVAL OF EXCITING CAUSES

THE treatment of lateral curvature must first be directed to the removal of all exciting causes. If the length of the legs is unequal the spine will be curved in the lumbar region towards the side of the shorter limb. This inequality must be corrected. Up to one-third of an inch the amount of shortness of one limb may be corrected by the addition of the deficiency to the heel only of the boot, but if it exceeds that amount something should be added to the sole also. For instance, if one inch is the amount of shortening, then it is well, besides adding that extra thickness to the heel, to put one third of an inch on the sole, otherwise the toes will be too much depressed; but the thickness on the heel alone corrects the shortness. If the deficiency is greater, say, two or three inches, then a carefully constructed platform for the foot is required.

If one leg is fixed in an adducted position towards or across the other, then, although it be the same length as the other, yet the patient will have to lift up the pelvis on the side of the affected leg until the foot is flat above the ground (figs. 1 and 2). It will

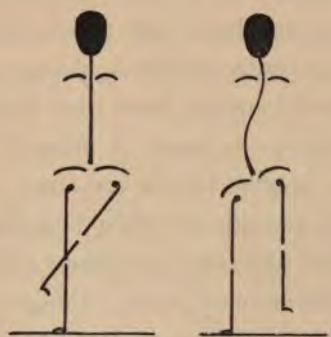

FIG. 1. FIG. 2.

FIG. 1.—Diagrammatic representation of a leg held in an adducted position by ankylosis or by contraction of adductor muscles.

FIG. 2.—Diagrammatic representation of the effect produced by the patient bringing the adducted leg parallel with the sound leg. The pelvis is tilted, the spine curved to the left, and the affected limb held some distance above the ground.

then be seen that the foot does not reach the ground, but requires (so long as the forced adduction remains) artificial support to enable the patient to walk; the spine, moreover, will be curved in the opposite direction (fig. 2).

It is always desirable to correct this condition either by division of the adductors, if their contraction is the cause, or, in the case of fibrous ankylosis, by forced movement, or, if there is bony union, by osteotomy. If the deformity has been of short duration, the straightening of the limb will alone suffice to cure the spine; but if the adduction has existed long enough to cause structural changes in the spine, then some special means must also be taken to correct the curvature. In cases of infantile paralysis of one leg there is often lateral curvature from a giving way of the affected side, and then the proper support of the leg and the necessary operations will in the same way relieve the crooked spine. Congenital displacement of one hip is another cause of inequality, but in these cases the spine is generally curved in the opposite direction from the efforts of the patient to lift up the limb of the affected side. The reason of this action is that the patient unconsciously realises that the joint is unstable and will not well bear the strain caused by allowing the body to subside in that direction.

These instances will suffice to show the line of treatment to be adopted when the base of the spine is thrown out of its proper plane. In those cases of lateral curvature in which, when the patient stands

upright, the pelvis remains level, we may yet have an inequality as an exciting cause. The habitual posture of the patient may be one-sided, and the postures engendered by school work are proverbially bad. This part of the subject I have dealt with extensively in other writings, and therefore I will not enlarge upon it here, except to state that very few people engaged in teaching have given much attention to the subject. At a few schools that I know, however, the principals have, at my suggestion, provided means for pupils who are delicate to do their work lying in the prone position, this being the only effective way of preventing bad postures during school work.

RECUMBENCY

The prone posture, if provision be made for the patient's legs to slope downwards from the hips, with the body lying entirely on the flat part of the couch, allows the spine to rest in its best position. Almost every body-movement of the patient, when resting in this way, brings into action the muscles of the back. In reading, for instance, the pupil is obliged to hold his head up by using the dorsal muscles. In the supine position, on the contrary, the pupil must rest perfectly quiescent, with a small pillow under the

lumbar part of the back, if the spine is to be kept in a good position. Every movement (when the patient is supine) towards an upright posture, such as in reading a book held in the hands, tends to round the back; moreover, it brings into action the abdominal and pectoral muscles, and leaves the dorsal muscles unused.

The use of a properly constructed prone couch

FIG. 3.—Patient lying on the prone couch. The sloping part is from the hips downwards.

(fig. 3), or cushions placed in the same position on the floor, will alone do a great deal to benefit a weak or slightly curved spine. If a patient suffering from lateral curvature could always occupy such a position, and could also carry out a suitable course of exercises at several periods during the day, he would be following out a very effective plan of treatment. But consider the drawbacks! What a terribly irksome life

for any young person to lead to be constantly lying down! Such treatment would have to be carried out for many months to produce permanent good to the spine, and therefore it cannot be recommended. Moreover, other more simple and equally effective means are at our disposal.

When we are treating a patient by exercises, however well devised our plan may be (even if while the treatment is being carried out the spine can be brought into a straight position), there must be a temporary relapse of the lax spinal joints into their former crooked position in the intervals between the exercises. When a patient is actively employed, as in playing outdoor games, or even in walking about, there is far less tendency for the spine to relapse than when sitting in a chair, and therefore we may adopt the middle course of only using the couch for resting, and prohibiting the use of chairs.

MUSCULAR EXERCISES

Exercises for lateral curvature require much care and consideration. There seems to be a very general idea not only that lateral curvature is one special kind of weakness, but that for that weakness there is but one special remedy, and that remedy 'Exercises,'

however carried out. Consequently, any professor of gymnastics or calisthenics, or any teacher of Swedish, Danish or other system, is thought competent to carry out the necessary treatment. A strong proof of the fallacy of these views is the fact that **of several hundreds of very severe cases of lateral curvature which have come before me, the great majority have previously gone through a course of special exercises during some period of the development of the affection, and such treatment has failed in these cases to arrest the deformity.**

To be effectual, the exercises must be very carefully devised and intelligently carried out, and the knowledge of the surgeon as to the exact nature of the affection and his familiarity with the physiology as well as the anatomy of the parts involved must be applied in supervising this treatment.

Chapter III

TREATMENT (*continued*)

MUSCULAR EXERCISES (*continued*)

EXERCISES in the treatment of lateral curvature of the spine may be used for three different purposes :

1. With the object of increasing muscular power.
2. With the object of improving the general health of the patient, and—
3. With a view to correcting abnormal curves by direct muscular action.

The first two of these objects may be considered together, because in carrying out the first it is very necessary that we keep within the bounds of the second.

After any muscular exertion, even in health, the muscles used are, for a time, weaker than before. It is the reaction after exercise which produces strength, not the exercise itself. If the exertion exceeds a certain degree, then the reaction is defective, and increased strength is not attained.

The strongest man may be harmed by overwork, and it is extremely easy to harm a weak child by allowing him to exert himself too much.

We all know that after a severe illness, which has necessitated prolonged recumbency, active movements on the part of the patient must be very cautiously commenced, and only very gradually increased, and that if the patient oversteps the bounds of prudence in this respect, he may suffer a severe relapse or greatly retard his convalescence.

If such a result occurs it is from too great a strain having been placed upon the patient's physical powers.

A child affected with lateral curvature, or even one suffering from a weakness which threatens to produce curvature, is not in a perfectly sound condition. Although there may not be that extreme weakness which follows a severe illness,[1] yet the patient is not strong and healthy, and it is therefore necessary to limit the exercises to an extent which that patient can bear without fatigue. Many such weak children are even benefited by complete rest for a time, and when a course of remedial exer-

[1] Many cases of lateral curvature have been preceded by the common diseases of childhood, such as scarlet fever, measles, and especially whooping-cough.

cises is commenced, such exercises should at first be *passive*. That is, the patient should lie quietly while the teacher moves the limbs. After a time (perhaps only a period of a few days) the patient may begin to offer resistance to the movements, and subsequently may exert himself without any muscular help from the teacher, and in the course of time the latter will resist the movements she directs the pupil to carry out.

GENERAL EXERCISES

I do not purpose to give full details of all the general exercises which can be used in this treatment, as to do so would involve the writing of a voluminous treatise upon the subject; but I hope that the few rules which I subjoin, and the examples of typical postures which I portray, will suffice to enable the reader to grasp the general principles of the work.

A FEW RULES TO BE OBSERVED

1. The patient must be in a fit condition. That is to say, he must not be in too feeble a state, and we must be quite sure that no disease is present (caries, for instance) which would contraindicate all movements.

2. The teacher must be skilled in her subject and discreet, so that she will not overwork her pupil.

3. The exercises must be given with the patient recumbent (except at a very late period of treatment, when the tendency to lateral curving is practically overcome, and then sitting or standing postures may be allowed).

4. Breathing exercises should be very thoroughly given, and under all circumstances full expansion of the thorax should be repeatedly practised.

5. The prone position should be alternated with the supine.

6. The clothes should be quite loose.

7. The patient should not be tired from any previous exertions, such as taking a long walk.

8. The patient should rest after the exercises long enough to feel refreshed.

The following figures have been selected to represent the more typical postures in the general exercises, but it is important that their underwritten descriptions should be carefully read.

FIG. 4.—First position, with resistance by the patient. In the second position the arms are raised and the teacher resists.

FIG. 5.—Arms extended, the teacher resisting while the patient bends the arms back to position shown in previous figure.

FIG. 6.—Arm extension without resistance, second position. In the first position the arms are flexed and the fingers touch the shoulders.

FIG. 7.—Arm extension, third position.

FIG. 8.—Simultaneous leg elevation. The arms are extended to balance the body. This exercise has a powerful effect upon the abdominal and lumbar muscles, and has to be attained by gradual slighter movements.

FIG. 9.—Simultaneous leg and arm circling. The combination of these exercises is only carried out in exceptional cases and requires considerable strength.

FIG. 10.—This figure shows the first position for the exercises in fig. 11 and fig. 12.

FIG. 11.—Body flexion backwards and forwards. This exercise requires considerable practice before it can be done *evenly* to the extent shown.

FIG. 12.—Kneeling body movement. It would require many figures to show the details of this exercise. Before it can be carried out satisfactorily more simple degrees of the position have to be practised.

FIG. 13.—Backward bending with legs fixed. If forward bending to a sitting position is required the patient must have the knees bent over the edge of a shorter couch and there fixed.

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RESULTS OF GENERAL EXERCISES

The effect of these general exercises (if thoroughly carried out) will have been to fulfil the objects Nos. 1 and 2, mentioned on p. 13.

The muscular power of the patient will have been increased, and the general health will have been improved. By such means a great many cases of incipient lateral curvature may be cured, but it is desirable that the surgeon should examine the patient from time to time to *see* that such a favourable result is being attained, and if he is not satisfied upon this point he ought to substitute some more effective treatment as advocated elsewhere in these pages. An intelligent patient ought to be able to learn these exercises after a few weeks of careful tuition, after which, with the help of her governess or nurse, who has watched the work of the trained teacher, she may be expected to keep up the treatment for a sufficient number of months to effect a cure. In a severe case, however, it will be safer to rely upon the skilled supervision of the teacher for a longer period, but in the majority of instances the course above suggested will suffice. The surgeon should be the judge as to which plan should be followed.

CHAPTER IV

TREATMENT (*continued*)

MUSCULAR EXERCISES (*continued*)

SPECIAL EXERCISES

EXERCISES given 'with a view to correct abnormal curves by direct action.' (Object No. 3, p. 13.)

Here we have a very complicated matter for consideration. It is far from easy to set in action just those muscles which will counteract the curves without at the same time causing other muscles to act in a detrimental manner.

Every surgeon who has much knowledge of deformities knows that one decided curve is nearly always compensated for by a lesser bend, above or below the primary one. This means that the patient's own (often unconscious) muscular efforts to counteract or overcome a primary curve produce, not a lessening of that curve, but a new one in another part of the spine.

That is to say, if anyone who finds himself bending to one side makes an effort to hold himself upright so as to restore his equilibrium, he produces a new curve in the opposite direction to the original one. This fact proves that *general* exercises (especially when given with the patient in an upright position as so often advised) are not calculated to correct the real deformity, although they may improve the patient's appearance to the ordinary observer.

In order to make this point plainer, I call attention to fig. 14, which is a diagram of a lumbar curve with the spine above in the position which that curve would induce if it were not compensated for in the manner referred to.

The lumbar curve to the left has caused the spine above to bend over to the right.

Now no one could walk about in this manner, and so he makes an effort to straighten the spine.

We would wish that he could straighten the lumbar curve, but as that curve is an established one, that is the joints, and perhaps the bones also, having grown to that position, the efforts of this patient do not cause a straightening of that curve, but they produce a compensating curve in the dorsal region. Thus a double curve is formed as shown in fig. 15.

Of course in reality the compensating curve closely

follows, or is formed almost simultaneously, with the original curve.

By this action on the part of the patient he will have improved his general appearance (in clothes) by producing a new curve, not by lessening the primary one.

Now in devising exercises to act specially upon

FIG. 14.

FIG. 15.

Diagrammatic representation of the skeleton seen from behind.

one side we must take the above facts into consideration and arrange to control one curve while we are acting on the other.

ROTATION OF THE SPINE

Another very important matter which requires consideration in arranging these exercises is rotation

or twisting of the spine, which almost invariably accompanies lateral curvature. I have dealt with this subject fully elsewhere,[1] so I will now only refer to it briefly.

The twisting of the bones causes the bodies of the vertebræ, which lie in the cavity of the trunk, to

FIG. 16.—The deformity seen from above.

curve more than the spinous processes in the back. So that in an imaginary transverse section of the thorax, fig. 17, it will be seen that the ribs on the side of the convexity of the curve are so twisted round that they form a projection in the back, a 'hump,'

[1] *Curvatures of the Spine.* 4th Edition, 1896. Smith, Elder, & Co., London.

also seen in fig. 16, which is a case of very severe rotation. In fig. 16, however, the rotation and the hump are on the left, whereas in fig. 17 the hump would be on the right side.

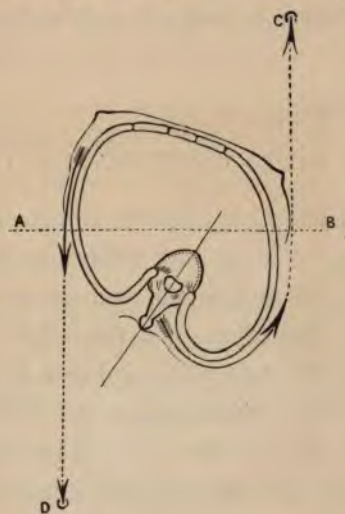

FIG. 17.—A diagrammatic transverse section of the thorax in the mid-dorsal region. The dotted line A B represents the transverse diameter of the pelvis, indicating the degree of twisting of the thorax. The line through the vertebra must be compared with the line A B. The arrow on the right side represents the direction of action of the muscles extending between the spinous processes and the right arm when that arm is drawn backwards. The point C represents the attachment of the pulley at which the arm is working. On the left side, the arrow indicates the direction of pull between the arm and a pulley at D.

When a patient affected with lateral curvature

bends the back by stooping, this hump is increased in size because the stooping makes the vertebræ twist more. It therefore follows that all stooping exercises are harmful. Upon the contrary, exercises to extend the spine (that is, to make it more upright) are beneficial.

EXERCISE TO COUNTERACT ROTATION

I have devised an exercise to act specially upon this rotation. I bring into action the muscles which extend from the arm to the spinous processes of the vertebræ and the effort pulls the spines of the vertebræ towards the right side, as shown by the arrow in fig. 17, and that action moves the vertebræ so that the bodies pass to the left. Thus the bones are untwisted—on the left side the muscles which pass from the arm to the front of the thorax are brought into action with the object of drawing backwards that part of the thorax which is the more prominent. Although this plan of exercise acts directly only upon the dorsal curve, yet the resistance of the pelvis to the action of the arms tends to twist the lumbar part of the spine in the opposite direction, and thus produces the exact effect that is required. If more direct action is needed for a lumbar curve the lumbar

muscles may be brought into use upon the *convex* side of this curve. The object of this system is to lessen the curves upon their convexities and to rotate the vertebræ back to their normal position.

This exercise, like those described previously, should be carried out in the recumbent posture, but for the purpose of showing its action better, I have had the following photographs taken while the patient was sitting on a chair. Fig. 18 shows this patient sitting still, with the left arm supported on the back of the chair she is sitting on, in order to keep that side from collapsing downwards, preparatory to exercising the right arm in the manner just described. A white line extends upwards from the rim of the pelvis, and it will be observed that the side of the thorax touches this line.

Fig. 19 shows the patient using the right arm in the manner described, an action which has immediately straightened the spine by untwisting the vertebræ. The side of the thorax has receded from the white line.

Under ordinary circumstances, when the patient would be recumbent in the prone position, the left arm would be brought well forward on the couch, and the teacher would control the lumbar curve by placing the left leg in an abducted position in order to

keep the lumbar curve from being influenced by the exercise of the right arm.

An Objectionable Exercise.—One exercise which has been recommended for acting directly

FIG. 18.—Dorso-lumbar curvature, the dorsal curve being most prominent about the tenth dorsal vertebra.

upon the dorsal curve has been devised with the object of drawing out the *concave* side of the curve by use of the arm of that side, but this exercise tends to increase the twisting of the spine, and it is therefore objectionable.

It should be remembered that the spinous pro-

cesses are directed, in consequence of the rotation of the vertebræ, towards the side of the *concavity* and that the rotation is the part that offers the more serious obstruction to treatment. The effect of this

FIG. 19.—The same patient as in fig. 18 drawing back an elastic expander with the right arm, thus using the muscles between the shoulder and the spinous processes of the deflected dorsal vertebræ, straightening the whole spine and un-rotating the vertebræ. The vertical lines from the outer side of the pelvis show the relative positions of the side of the body, without (fig. 18), and with (fig. 19), the active exercise. The hips in both figures should be observed.

latter exercise is obviously to draw the spinal processes further in the direction of the concavity and consequently to increase the rotation.

It does no good to straighten the line of the spinous processes if at the same time we increase the twisting, and thereby increase the 'hump.'

EXERCISES TO STRAIGHTEN A LUMBAR CURVE

The same principles apply to a lumbar as to a dorsal curve. The lumbar vertebræ have no ribs attached to them to be forced into a hump when twisted, but their transverse processes upon the convex side of the curve press back the lumbar muscles, thus making a very formidable projection, just above the pelvis. Fig. 20 shows a very severe case of this kind, one which could not, of course, be influenced by exercises.

By bringing into action the muscles connecting the leg with the twisted lumbar vertebræ, the latter bones are untwisted into a straighter position.

In carrying this out, as with the dorsal exercise, it is necessary to control the other curve. In such a case as that shown in fig. 18, the left arm would be kept up towards the head, pressure would be applied by the teacher's hand or in some other way upon the projecting ribs of the right side, and the right leg would be extended downwards, while the patient would actively abduct the left leg.

It is impossible to give more accurate details of these movements because they depend upon the peculiarity of individual cases, and it is only by

FIG. 20.—The arrows point in the direction in which support is required.

experimental movements in detail that we arrive in each case at the exact position or action required.

CHAPTER V

TREATMENT (*continued*)

MASSAGE

MASSAGE has been advocated as a remedy for lateral curvature, just as it has been for all kinds of deformity and weakness of the spine.

This remedy is, in certain cases, unquestionably of great value in the treatment of postural curvature of the spine; but it must not be applied indiscriminately, and in the majority of cases of lateral curvature it is quite unnecessary.

Moreover, if massage is substituted for more effective treatment, as so often happens, the deformity may progress from a curable into an incurable condition while it is being thus trifled with.

Let us consider the action of massage on the body when skilfully administered. It stimulates while it soothes the tissues which are massaged, it

exercises the muscles passively, and it increases the circulation both of the blood-vessels and the lymphatics.

Massage is of special value in promoting the absorption of old-standing deposits in the tissues, and for this reason it is effectual in the treatment of sprains and stiff joints, and in old effusions of blood or plasma.

Massage, if given with discretion, improves the nutrition of any part of the body to which it is applied. For this latter reason it will act beneficially in almost every case of postural curvature, provided other necessary treatment is carried out; but the same statement might be made in respect to scores of ailments in which massage is not usually considered necessary.

The majority of cases of lateral curvature can be treated successfully without massage, and therefore we should not prescribe this expensive method of treatment unless we see some special reason for so doing.

The Indications for Massage are as follows:

1. When treating patients by exercises without apparatus, massage is generally useful.

2. When treating patients by means of apparatus, and the patient happens to be extremely feeble, with

very inefficient powers of digestion and unable to take ordinary exercise.

3. In adults, and especially in elderly patients.

4. In cases where some complication, such as rheumatism, exists.

Caution as to Massage.—In referring above to the influence of massage in promoting nutrition I qualified the statement by the words, 'if given with discretion.' I meant that the operator must avoid over-working the patient, for, just as exercises may easily be given in excess of the patient's strength, so may it happen with massage.

The Method of giving Massage.—The best and most comfortable position for the patient during each application of the massage is upon the prone couch already described, because in this position the back assumes its natural antero-posterior curves. The next best position is lying prone upon a bed or mattress with a pillow beneath the abdomen. The use of a lubricant is less fatiguing to the patient than dry massage, and a very good medium is camphorated oil.

Massage in the early stages should be applied with great gentleness at first. Care must be taken not to press upon the concavity of the curve, as such

pressure would be very likely to increase the rotation. The convexity of each curve should be supported by one hand, while the other parts are operated upon gently, but the extent to which this support is carried out should be regulated by the surgeon.

In applying massage to the convexity, gentle pressure may be used, but in the early stages the less that is attempted in the way of correcting the curves by this process the better.

During the progress of treatment of the curvatures —that is to say, after perhaps three months' mechanical and other treatment has been carried out—massage may be useful to hasten the progress, and can then be applied with somewhat more firmness than in the early stages.

When, after a certain period of treatment of a case of curvature, the spine is found to be straight, the muscles fairly well developed, but the body not quite so robust as one could wish, a course of massage will often ensure the permanence of the good position.

Fuller details it would be difficult to give, because each patient presents personal peculiarities. In all cases the surgeon ought to watch the progress of the treatment, seeing the patients at intervals according to his discretion.

Weir-Mitchell Treatment.—In a few cases, not

above 1 or 2 per cent. of those which I have dealt with, I have found that, after several months of treatment, although the spine has assumed a perfectly straight position, the bodily strength has not sufficiently improved. There has been an inherent weakness, which ordinary remedies, such as fresh air, good feeding, and tonics, have been incapable of altering.

In these few cases I have adopted the Weir-Mitchell system of massage, rest and feeding, *not for the sake of overcoming a neurasthenic condition*, but with the object of improving the nutrition of the individual. The results have been most satisfactory, and the patients have been able to give up all special treatment soon after the course has been carried out.

CHAPTER VI

TREATMENT (*continued*)

MECHANICAL TREATMENT

HOWEVER perfect the exercises may be, however efficiently and persistently they may be carried out, they yet may fail to cure or even to prevent the increase of deformity. The effect of such 'Exercise' treatment must be closely watched, and directly it is seen that the remedy is not effective, mechanical help must be substituted or added. I know too well how strong is the prejudice against mechanical apparatus, and such prejudice is founded upon facts. From time almost immemorial monstrous machines have been made for crooked spines by mechanicians, and it remained for my late colleague at the City Orthopædic Hospital, Mr. E. J. Chance, to devise an apparatus constructed upon scientific surgical principles, and quite free from the evils which belong to the instrument-maker's mechanical corset or jacket.

The complaint is often made that a spinal instru-

ment interferes with the development of the muscles ; the splint I refer to has the very contrary effect : it encourages muscular action. It is said that by the use of instruments the development of the body is retarded, but the apparatus I mention promotes it. The chest is left free for expansion ; the arms are drawn back, but left free for up and down movement, for there are no crutches. Whilst wearing this instrument the patient, when he can hold himself straight for a short time, is free from support, but directly he relaxes his position he is checked from falling into bad postures by the apparatus. It is not so much a support as it is a guide to the patient to hold himself straight. It therefore encourages movement in the right direction. Without any apparatus, the patient affected with lateral curvature cannot as a rule move his arms or body in ordinary actions without bending his spine into worse positions, but with the apparatus I refer to he is obliged to move himself in the best directions.

The worst kind of apparatus is the felt jacket ; it binds up the body in a fixed stay, is impervious to moisture, and can only prevent stooping by pressing on the front of the thorax. The illustrations figs. 21 and 22 show the comparative effects of the felt jacket and Chance's apparatus.

The girl there shown, fig. 21, had worn the felt jacket for two years, and her spine was getting worse. It will be seen how the chest was hollowed out and the head depressed. The other splint (the splint I used), fig. 22, was put on, and the photograph taken directly after the felt jacket had been removed, showing the immediate effect of the more scientifically devised machine. To show that the muscles develop with the use of the apparatus I give the following illustrations. Fig. 23 (p. 44) represents a girl aged 13 whose back was typically weak, and who could not sit up in a better position. The deficiency in muscular development of the back is clearly shown, and the curvature is well defined. Fig. 24 shows the same patient after four months' treatment, during which period she wore the instrument every day. The instrument was put on every morning upon getting up, and not taken off until the patient retired to rest at night. The straightness of the spine is perfect, and the developed muscles stand out in strong relief.

I have elsewhere so fully described the action of the apparatus,[1] and expressed my views upon the treatment of lateral curvature, that I will write no more upon this point, except to say that, as far as

[1] *Curvatures of the Spine.* 4th Edition, 1896. Smith, Elder, & Co., London.

exercises alone will do good, by all means let us apply them ; but when this system fails, or when we

FIG. 21.—Shows depression of the chest and roundness of the back in the felt jacket.

have to deal with a decided change in the shape of the spine, we ought to supplement the treatment by

FIG. 22.—Shows the effect rapidly produced by the 'Meta Splint' in the same patient as fig. 21.

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the use of mechanical apparatus, for by that means alone in such cases are we able to effect a cure or an improvement.

FIG. 23.—Miss S., aged 13, with double lateral curvature, dorsal to left and lumbar to right, with much kyphosis. The lower dorsal and all the lumbar vertebræ project considerably. She was unable to sit more upright than here shown. An instrument was at once applied.

FIG. 24.—Miss S. Four months later. The spine is not only straight, but the muscles of the back have been well developed and stand out prominently. The instrument had been put on every morning, and not removed till the last thing at night.

GENERAL PRINCIPLES UPON WHICH TREATMENT SHOULD BE BASED

I will now describe in a more general manner the principles upon which I have acted in treating lateral curvature of the spine. General physical weakness, frequently associated with too rapid growth, and often caused by inefficient feeding, being a very common cause, there are plenty of exciting influences in the ordinary postures of life which will have a directing influence in producing a particular form of curvature.

General weakness leads to inability on the part of the patient to keep the spine in an upright position, and especially is this so when he is sitting down without the back being properly supported. In the majority of these cases one might almost *infer* that an undue softness of bone and laxity of ligament would accompany a general condition of weakness, but we have also direct evidence that this softness and laxity are present in many instances.

We may find other joints of the body besides those of the spine affected by this sort of weakness, exemplified by flat-footedness and weakness of knees,

and particularly a great flexibility of the finger-joints, wrists, and elbows.

If nothing be done for this class of patient, a rapid increase in the curves takes place, and deformity quickly develops. Children who have outgrown their strength, and are perhaps two or three inches taller than they ought to be for their age, and whose vitality is below its normal condition from deficiency of nitrogenous food, are those who chiefly suffer.

The belief that some undue softness of bone has to do with the production of lateral curvature was held, as I have already stated, by many of the observers of a past period, and it is probable that this condition consists in nothing more than want of vitality during development.

Everything tends in the present day to the increase of nervous energy at the expense of the physical, and it seems possible that such a tendency shows itself in the rapid growth of the descendants of men and women whose nervous systems have been thus excessively developed, as distinctive from the tendency to robustness which belonged to an age when life was passed more deliberately.

If we accept this view as to the general condition of the majority of patients who develop lateral

curvature, we shall modify very considerably our opinion of the popular ideas as to necessary treatment. It having been determined by some medical practitioners that the muscular system alone is weak, it has been thought that it is a rational remedy to resort to systematic exercises to restore these structures to a state of health, and doubtless during some period of the treatment active muscular exercises may be given with benefit. I would, however, urge that not only is such a method incapable by itself of meeting all the difficulties of these cases, but in a great many instances it will do more harm than good. The treatment of the muscular system alone cannot do all that is required, and so long as the bony and ligamentous tissues remain soft and liable to easy alteration in their form, so long will undue exercise tend to produce further deformity rather than relieve it.

A weak, enfeebled, overgrown child will bear very little exercise with benefit, and will often, as already stated, be strengthened rather by temporary rest than by an increase in its movements.

In contrast to these delicate children one meets with typically robust young people who are suffering from lateral curvature, and there may even be very severe deformity in these cases. It is difficult in all

instances to trace the origin of such a condition. It may have commenced when the patient has been in a weak state like those already described; but sometimes we see a direct cause in the form of a short leg or in some of the other exciting causes already mentioned. As to treatment of the weakly cases, which undoubtedly form the great majority of these deformed patients, surgeons who have had to deal largely with them have from time immemorial felt the necessity of sometimes using mechanical apparatus; but the majority of these surgeons have contented themselves with leaving the exact design of this apparatus to the ingenuity of the instrument-maker.

The consequence has been that these surgical appliances have been constructed upon purely mechanical knowledge, and little note has been taken of the physiological needs of the patient. In nearly all the appliances that have been made in the past the principle adopted has been that of a rigid corset, by which it has been attempted to prop up the body with crutches under the arms, or to press upon the thorax from the front. The interference with the muscular development which such an apparatus brings about has led in recent years to strong opposition to the use of spinal apparatus,

and many surgeons entertain a great prejudice against them. At one time I shared this prejudice, but that was before I knew much about the subject. When I came to study the difficulties of dealing with lateral curvature, I found that if we were to produce any alteration in the shape of a deformed spine we must in many cases use some mechanical method. At that time no description of a mechanical appliance which did not interfere with the development of the muscles had appeared, but an instrument was being used at the City Orthopædic Hospital, devised by Mr. E. J. Chance, which possessed the qualities which were necessary *to prevent the spine from falling into bad positions, whilst it allowed ample opportunity for the body to develop and the muscles to act.* I have to a certain extent modified this apparatus while retaining its principles. It is not an instrument-maker's machine, fitting closely to the body, but a very simple apparatus affording a means by which the surgeon can bring pressure or support to bear upon any part of the trunk he likes. The principles upon which it is constructed are described in the following chapter.

Chapter VII

TREATMENT (*continued*)

MECHANICAL TREATMENT (*continued*)

Chance's Splint.—The first object of treatment is to keep the spine as upright as possible in an antero-posterior direction, for, as it is a well-known fact that flexion (stooping) increases the deformity, and especially increases the rotation of the vertebræ, on the other hand, extension (uprightness) has a contrary effect.[1] To further this object, patients are often made to lie down, or rest in chairs which fit into the lumbar region, and so support the spine in a good position, and this is really mechanical treatment. Instruments usually fail to a great extent in keeping the spine upright because they depend upon crutches for propping up the body, and crutches would have to be very high and painful, as well as detrimental in other ways, if they kept the spine sufficiently

[1] There are other reasons for counteracting this posture, and these I have described on p. 73, *et seq.*

erect. In the majority of cases the back tends to bulge posteriorly in the lower dorsal and lumbar regions, and it is certainly desirable to control this projection. Instruments, as usually made, either leave this part unsupported or they curve into the hollow and act as permanent supports. The tendency of the latter machines is to relieve the muscles of the back from action, and to conduce to their degeneration and ultimate weakness.

To overcome this evil effect I discarded rigid stays and restraining spinal instruments (including felt and other jackets) and used the light support above referred to.

In slight cases it will be observed that when the patient stands erect the back is straight, or nearly so, and the natural lumbar curve is formed. When, however, the patient sits down, the spine immediately bows backwards, and the lateral curve takes place. If we can prevent this bowing backwards we retard the increase of, or even remove, the lateral curve.

The simplest form of the apparatus is shown in fig. 26, in which it is applied to a case of slight lateral curvature connected with drooping of the shoulders and head. Fig. 25 shows the patient before treatment. Fig. 26 shows the result of a few weeks' use of the apparatus. The median bar, made of light steel,

reaches from the level of the shoulders, A, to the seat, B. The soft shoulder-straps act directly backwards. C is a square pad placed in the lumbar region, which prevents the back from protruding posteriorly. The pelvic belt retains the lower part of the apparatus in

FIG. 25.

FIG. 26.

position. The belt, D, restrains the abdomen from coming too far forward. This band is never made very tight, but the body is balanced between it and the pad at C.

The back, in sitting (when it ought to be sup-

ported), rests against the pad, C. In standing or walking the back ceases to rest against C, and is restrained from coming too far forward by the belt, D.

There is no interference with any of the muscles of the back, or of any other muscles, but a support is always ready to restrain the body from falling into a bad posture when the muscles cease from acting. In most cases side plates are attached to the central bar, A B, for the posterior part of the ribs to rest against. The pad, C, is so arranged that it does not act when the patient is holding himself erect—when, in fact, it is not wanted—and so the dorsal muscles are quite free to move; but directly the spine is allowed to subside, then the back comes in contact with the pad, and is prevented from bulging any further.

Some cases, no doubt, may be cured without mechanical means, but even such will require far more time and attention and trouble to the patient than if they are treated with this apparatus, and, moreover, the results of the non-mechanical treatment are never certain and often fail. I have stated this fact in other words, as follows:—'Those few cases which would be permanently benefited by the "movement cure" will derive an equal amount of

good from the treatment here advocated at a tenth part of the trouble and expense.'

In the case shown, fig. 25, the usual projection backwards of the lumbar or dorso-lumbar region does not occur, but generally the latter part gives way in a very marked degree in the sitting posture. This is shown in the illustration given below (fig. 27), and figs. 28 and 29 show the effect of treatment.

As the case proceeds, the pad, C, is gradually brought nearer to the natural position of the spine, and thus a back which at first protruded very considerably is brought by degrees into a normal shape. Never, however, is the pad placed so forward that it retains the spine in one position; on the contrary, there must always be room left for action of the muscles and movement of the vertebral joints.

The result of this plan of treatment, which differs absolutely from all other mechanical means, is that patients with backs so weak that they cannot sit upright for more than a moment will, in a very short time—say, a month, or in even less time—show a very decided increase in power. Backs which have been quite flabby to the touch have become hard and muscular in a few months. (See figs. 23 and 24.)

The apparatus must be put on the first thing in the morning, and not taken off until the patient

retires to bed. Such an apparatus does not induce a patient to depend entirely upon its use; that is

FIG. 27.—Case of Miss G. Lateral curvature associated with severe kyphosis. Upon her first visit, she was quite unable to sit up straighter, except for a moment, and with a great effort. The spinous processes not only projected backwards, but were unduly separated from one another, showing that the vertebræ had become wedge-shaped.

to say, at any time in the process of treatment the support may be thrown aside, and the patient be, to

some extent, the better for having used it; or if used, as it should be, until the patient's back has become

FIG. 28.—Miss G. Wearing the apparatus. In this case a double bar instrument was used because the backward projection or the lumbar region was so severe.

FIG. 29.—Miss G., less than seven weeks after the commencement of treatment, sitting up with perfect comfort.

quite straight and strong, it may be discarded without any period of 'gradual leaving off.' Considerable care and discretion have to be exercised in adjusting the pads, for if we attempt to improve the position too much at first the patient will suffer pain, and, in fact, the effect will be intolerable. I find it of the utmost importance in the treatment of this affection to avoid producing pain or discomfort, and when a case is not proceeded with too rapidly the result invariably is that all disagreeable symptoms, such as aching or pain, are very soon relieved. The back pad, C in fig. 26, is retained in its place in a very simple manner, and when it is in use—*i.e.* when the back rests against it—it is kept in place and the patient's body is supported, first, by the shoulder-straps already described, which tend to draw the arms back and develop the chest; secondly, at the lowest part, by a simple pelvic belt; none of the straps being buckled very tightly.

The principle of this action is shown in the following figure.

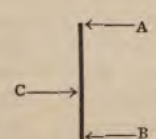

FIG. 30.—A represents the arm-straps. B represents the pelvic and abdominal belts. C represents the back pad.

In the less severe cases this apparatus, in its more simple form, will enable us to effect a cure, but when the lateral curving is very marked, something more must be done; lateral plates must be applied to counteract the lateral curves. Here, at least, it may be thought, the principle of allowing freedom to the muscles must be abandoned, but it is not so. The lateral plates, if properly adjusted, will take effect, while the muscles of the back are allowed to act freely. The patient should be advised to endeavour to 'get away' from the lateral pressure. If patients hold themselves so that the pressure is relieved, they are effecting *by muscular action* more than statical pressure of the plates would accomplish, whilst when not making this exertion the plates support the back from falling into a worse position.

The fact that this muscular action takes place removes an objection sometimes raised against the use of lateral plates. It has been asserted that these plates cannot affect the spine very much, because they have to act (in the dorsal region) through the ribs. Now, the patient having room to move and being encouraged to hold himself away from the plates, he uses his own efforts to straighten the spine in a manner which would be impossible without the apparatus. The practical results of this treatment

confirm the theoretical, although it must not be supposed that good results can be obtained very easily. Mechanical aptitude and considerable mechanical knowledge are absolutely necessary to the surgeon who would straighten a curved spine. It is unreasonable to expect success if we delegate to instrument-makers the devising, the adaptation, and the adjusting of instruments with which we aim at solving a very difficult surgical problem. Knowledge of the physiology of the movements of the parts affected, of the anatomy, and the nature of the pathological changes which may take place, is required before the operator can form a judgment as to how best to apply and adjust his mechanical measures.

The use of this apparatus is one of the most important helps to the treatment of lateral curvature, but in addition we have, of course, to deal with the general condition of weakness, and the most potent remedies for benefiting the patient in this respect are the carefully devised exercises already described and the administration of a full and nutritious diet.

GENERAL VIEWS REGARDING THE USE OF APPARATUS

The machines which have been used in the past for the treatment of this deformity have been so complicated and so unscientific in their action that a general dislike to their employment has been engendered. This dislike has therefore been founded upon good reasons. It has been a great task to overcome the prejudice thus set up against mechanical methods of treatment; but, upon the other hand, it is very satisfactory to find that year by year the merits of such an excellent apparatus as that devised by the late E. J. Chance become more and more recognised, and I know of no instance in which any medical man, after carefully acquainting himself with the action of this apparatus, has failed to admit its value in suitable cases. Of course it is difficult for anyone to realise that there can be a spinal apparatus in existence which differs absolutely from every other machine made for the same purpose; and, in fact, no one can realise it unless he sees it in use and understands the manner in which it acts.

This last-mentioned fact was exemplified by the

they could not be satisfactorily dealt with by exercises alone.

FIG. 31.—Girl, aged 10. Kyphosis associated with lateral curvature. The projection is chiefly from 8th dorsal vertebra to 1st lumbar. The chest and abdomen are depressed. She was unable to sit up straighter than here depicted. February 13, 1897. (This figure is on a much larger scale than those which follow.)

The young man aged 17 (fig. 35) was able with a considerable effort to sit up straight, and for this and

other reasons I preferred not to use an apparatus. He is very determined and painstaking, and will, I have no doubt, make a good recovery. It will take

FIG. 32.—Miss G. S., aged 14. Quite unable to sit up any straighter than shown in this figure. General weakness and loss of appetite. Curvature extended from head to lumbar vertebræ. Hollowed chest. A vertical line passing upwards from front of chest passed behind the ear when the patient was looking straight forwards. August 13, 1897.

longer to cure him in this way than if he had had mechanical help, but the result in his case will, I believe, be equally good.

The consideration of these conditions of round back is inseparable from that of lateral curvature;

FIG. 33.—Girl, aged 16. Began to stoop five years previously, got gradually worse and general health suffered considerably. A few months previous to visit had suffered much from pain in back. General kyphosis of whole spine, most prominent at lower dorsal region. September 3, 1901.

because a very large majority of cases of the latter deformity are either preceded or at least accompanied by stooping.

FIG. 34.—Girl, aged $5\frac{3}{4}$. Had previously suffered from double pleurisy, which had left her very weak. Profuse perspiration at night. Quite unable to sit up. Question at first regarding possible caries, but improvement so rapid after applying an apparatus that we were able to exclude the existence of this disease. August 30, 1899.

I have elsewhere[1] described these deformities under the terms 'Posterior Curvature of the Spine or

FIG. 35.—Young man, aged 17. There was also lateral curvature, lumbar to left. Could only straighten himself for a moment, but by arrangement of chair and cushions I managed to keep him more upright and treated him with exercises, without other support than the chair. He improved very well and had made great advance five months later. February 28, 1903.

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[1] *Curvatures of the Spine.* 4th Edition, 1896. Smith, Elder, & Co., London.

Kyphosis,' or 'Excurvation' of the Spine, as Bampfield called it in contradistinction to 'incurvation.'

In the work referred to I explained the effects of a round back upon respiration and other bodily functions. I described how the deformity interferes with the normal movements of breathing, how the expansion of the lungs is diminished, and thereby the vital capacity of the individual restricted by the consequent flattening or hollowing of the chest and abdomen.

It must be obvious to any medical observer that the result of this deformity is not only to deteriorate the appearance of the individual, but also to damage the action of all the thoracic and abdominal organs; lungs, heart, stomach, and bowels.

As the lungs cannot expand fully, they do not receive enough fresh air, and are therefore rendered particularly liable to disease. As the stomach is pressed upon it cannot perform its functions well, and indigestion is one of the results which follow. The like happens with the bowels, and constipation and other abdominal irregularities are often the consequence.

Causes.—Roundness of the back may be caused by several diseases: caries, cancer, rheumatoid arthritis, asthma, &c.; but such conditions are not

under consideration in these pages. The affection with which we are concerned is a postural deformity caused chiefly by weakness, and by the frequent and long-continued assumption of the stooping position.

FIG. 36.—Master S., aged 9. March 1899.

In fact, it arises from much the same general conditions that we term 'predisposing causes' in lateral curvature.

There is one condition very commonly associated with round shoulders which requires notice. It is the growth of adenoids in the pharynx.

I believe that adenoids may be a cause of stooping, or in some cases a result of the bad posture, but as a rule both affections are brought about by general debility.

FIG. 37.—Master S., six months after the photograph for fig. 36 was taken.

Fig. 36 shows a case of very severe stooping, in which the patient also suffered from adenoids. The growths were skilfully removed, and the child improved in health, but the stooping remained until

he was treated by means of a mechanical support (fig. 37).

This boy, aged 9, was sent to me by Dr. Scanes Spicer, March 1898. He had suffered almost constantly for many months from violent cough and attacks of catarrh and bronchitis. A month previous to my seeing this patient Dr. Scanes Spicer had removed the growths and the tonsils, which latter were enlarged. The boy's general condition had improved very much, but he remained unable to sit up any more than shown in the above illustration (fig. 36).

Fig. 37 is from a photograph taken September 1898, six months after the other; and it shows the improvement in his powers of sitting up effected by the use of the light back splint during that time.

The weakness which arises from the febrile diseases of childhood is often a cause of rounding of the back. Rapid growth is another condition which may give rise to the deformity.

CHAPTER IX

STOOPING &c. (*continued*)

THE EFFECT OF BADLY SHAPED CLOTHES

A FEW years ago I wrote a pamphlet under the title 'Growing Children, their Clothes and Deformity,'[1] and I am now reprinting the chief part of that pamphlet with some few modifications and additions.

Among the direct causes of stooping there is probably none so common nor so powerful for harm as badly shaped clothes.

The views which I am about to express have been forced upon me by observation in the treatment of rounded backs, depressed chests, and crooked spines.

A mother may complain that her little daughter stoops, and that notwithstanding constant injunctions to 'sit up' the child is nearly always round in the

[1] London: Smith, Elder, & Co. 1899.

back when sitting, and if she does 'sit up' at all, it is only for a few moments at a time.

We remark that the clothes are too tight across the chest, preventing the child from keeping in a good position.

The mother replies, 'Oh no! I can assure you that my child's clothes are quite loose,' and she passes her hand underneath the frock and lifts it off the chest to show the correctness of her assertion.

This action is delusive; and in order to prove that the garments are too tight we may proceed as follows. If the clothes are buttoned down the front of the chest, which is the best arrangement, they should be undone, both frock and underclothing; the shoulders should then be held back as far as possible by the surgeon, and the mother should attempt to fasten the clothes again. The undervest or 'combination' is generally elastic, and with some effort can be buttoned, but it then produces a strong tension upon the arms which would alone induce the child to adopt her former bad position if left to herself. As to the other garments, it will be found that they will not meet by a considerable interval, probably not by 2½ to 3 inches at the upper part of the chest, narrowing downwards to a point opposite the pit of the stomach, and a like result occurs with the rest of the clothes (see fig. 38).

Often it is more difficult to demonstrate this want of space. The frock may be a 'smock,' and then it has no opening in front. It looks quite loose, but

FIG. 38.—Showing the gap produced in the frock when the chest is expanded.

when pulled down into place it will be found that, the shoulders being held forwards, the chest is contracted by it.

Children generally wear little stays, harsh and

firm in material, which often do not allow room for expansion of the lower ribs.

One error in the construction of children's clothes is that the space between the armholes is the same in front as at the back, or even narrower, and thus the arms are forced to a midway position which causes roundness of the back and depression of the chest. This harmful shape is found in the garments of even very young children. The evil influence of this forced position commences early in life, and by the time the child is brought to the surgeon at the age of, say, 5, 8, or 10 years, the body is already deformed by the constant influence of the clothes, so that the malposition has become habitual and seems to the mother quite natural.

I do not assume that a child ought to be always holding his shoulders as far back as possible, but certainly there should be no impediment to his doing so.

A child is naturally almost constantly moving, bending his back in all directions, sitting or standing upright, bending forwards and adopting all kinds of postures. Perfect freedom for all these movements should be allowed, and full extension of the back (the upright position) should be encouraged by every means.

Sitting in a chair is not an ideal position for a child, because he cannot sit upright without a constant effort, and when the back gets tired the spine subsides into a stooping position, or into lateral curves. It is very rare that the back of a chair is constructed so as to support a child's back when sitting.

The prone position (see p. 10) is the best, as it encourages full expansion of the chest, and allows the spine to assume its natural shape, provided always that the clothes do not interfere. Civilised custom requires the sitting posture at times, but we ought to lessen the evil of sitting by putting no impediment in the way of free expansion of the chest.

The bad influence of narrow-chested clothes having been commenced is continued. A child having once been moulded into an abnormal figure by garments wrongly shaped in the manner described—either home-made or ready-made—there comes a time when the clothes are 'fitted.' That is to say, the child is measured and the clothes made for it. The child's shape being already wrong, the clothes are made wrong also. The efforts of Nature to correct the deformity are frustrated by the dressmaker or the tailor. Exercises are devised, the boy or girl is drilled or made to undergo a course of Swedish or other gymnastics. During these exer-

cises it is probable that the pupil will wear a perfectly loose garment which permits freedom of movement in any posture, and the training will have a beneficial influence. Upon the other hand, no sooner is the lesson over than the victim returns to his ill-fitting clothes, and is pushed back into the old position.

The older he grows the more difficult it becomes to correct the evil, and the worse becomes the degree of deformity.

If the child escapes curvature of the spine, or some affection of the lungs, he is fortunate, but his liability to colds and coughs is invariably increased by the restriction of his chest capacity, and I could record, as I have already stated, many cases of young people, subject for years to attacks of croup, cough, and other chest troubles, who have been relieved from a tendency to these diseases by a rational system of chest development, accompanied by alterations in their clothing permitting such development to take place.

We will now deal with various articles of clothing in detail.

Braces, Belts, and Corsets.—Tight lacing is an old subject of complaint, and its pernicious influence

is unquestionable, but as far as my experience is concerned, cases of tight lacing are rare, and do not occur among quite young people. Stiff stays, however, although loose, interfere with the movements of the body, and it is always desirable to encourage perfect freedom of movement. If stays are to be worn, there is not much harm in their exerting some support to the abdomen so long as they leave the thorax free from pressure.

Tight constriction of any part of the human body is objectionable, for reasons which have been freely and fully discussed for ages, but it does not follow that a simple corset, a waist-belt, or a garter necessarily produces harm in this respect.

So great has been the objection raised to constricting bands that it has long been the custom to suspend most of the garments from the shoulders. This arrangement is harmful. A belt to sustain the nether garments, and garters to keep up the stockings, need not be tight enough to retard the circulation or to do other damage, whereas anything which weighs down the shoulders has a continuous bad influence upon the chest and spine. Non-elastic garters can be worn less tight than elastic ones, and are therefore the better.

Years ago when women wore several loose petti-

coats, the weight of which was very considerable, the pressure upon the abdominal organs caused by the suspension of these garments round the waist was

FIG. 39.

doubtless detrimental; but in the present day, when the wearing of close-fitting garments, which are much lighter, is customary, this objection does not hold

good, and the hips (even in the case of young children) provide an efficient resting place for the waist-band of the 'knickers' (see fig. 41).

In the case of underclothing, such as 'combinations,' there is a general bearing taken upon various parts of the body, and practically the nether parts are supported from the waist, especially if a waist-belt be added.

We should endeavour to *distribute* the weight of the clothes, and to leave the chest and arms as free as possible (see fig. 39).

We have practical evidence, regarding the value of freedom of the chest and arms, in the action of stablemen and others, who throw off their braces or make them into belts when about to do hard work with their arms.

The use of braces is carried to a very pernicious degree in the clothes of quite young children, who often wear stiff stays to which are attached braces which pass over the tips of the shoulders. Children wearing these straps are seldom comfortable. One often sees them 'hitching-up' their shoulders to keep the straps in position. These stays are worn chiefly with the object of keeping up the petticoats or knickers, for which purpose they are furnished with buttons at their lower border. The result is that the

petticoats or knickers are still suspended from the shoulders, and in the most detrimental way, because the straps, passing over the outer part of the shoulders, have a very powerful influence in constantly pulling down the arms and contracting the chest (see fig. 40). If such straps are to be worn at all, it would be much better to make them cross at the back and rest quite close to the neck. It is better still to discard these harsh stays and braces.

When pointing out this bad effect to a mother, I have frequently been met with the remark, 'How can I keep up the lower garments in any other manner?' I have then unbuttoned these clothes, and fastened them by tightening the waist-band so that they have been suspended by the waist—a plan which has acted very well.

If a child is so young that there is no waist and it is absolutely necessary to fasten the lower garments to the upper, then the upper part must be made differently from the corset referred to. In place of the corset a jacket should be worn fitting up to the neck as closely as the under-vest, with full space for the chest (see figs. 39 and 41).

A soft elastic material should be used instead of a harsh unyielding one. Then the upper part of the chest will be protected as well as the lower part, and

FIG. 40.—This child is wearing stiff stays to which are attached shoulder-straps bearing down the shoulders. The suspenders pull from the stays to the stockings.

FIG. 41.—This child is wearing an easy-fitting dress with room for the chest to expand, with a waist-belt to support the knickers and straps to the knees, which latter keep up the stockings.

a more uniform and complete garment will be provided.

The great liability to disease of the apices of the lungs, the portions which are situated beneath the collar-bones, is well known, and these upper parts of the chest ought to be protected at least as much as the lower.

It is very remarkable how commonly children's clothes leave this upper part exposed.

If the 'stay' garment is used for warmth, which should be its only object, it should not be restricted to the body below the level of the armpits. The rigid material of which these unshaped stays are made is objectionable, for although the garment may not fit the body tightly, its stiffness is not conducive to freedom of movement and free expansion of the chest. A soft vest is preferable.

Of late years it seems to have become the custom for boys to wear braces instead of belts, and I have almost invariably found the braces very tight and producing considerable downward pressure on the shoulders. Boys should wear belts, and to lessen weight knickers should take the place of trousers. With knickers their attachment below the knee will keep up the stockings, and then there will be very little weight to be suspended by a belt. If suspenders

are used to keep up the stockings, they should be attached round the waist, and should not be carried to the shoulders nor fastened to the body garment. The latter plan, as before explained, means suspension from the shoulders. Suspenders, even when attached to the waist, are often too short, tending to bend the body forwards.

'Knickers' and stockings are excellent for girls as well as for boys, and both can be kept up in the manner above described, i.e. the stockings by the knee-straps of the knickers and the knickers by a belt. Girls may wear a light petticoat and dress over their knickers.

Collars.—Harm may be produced by collars worn too tight, and there can be no doubt that the neck should not be compressed either by the collar or any other garment. The chief harm which I have noticed from the linen collar has been a pressing forward of the head by its depth at the back, made fashionable by the Eton boy's costume, and this is especially the case when the collar is worn outside the coat.

Underclothing.—Very tight-fitting underclothing is to be avoided for growing children at all times, because however elastic it may be, it will, if too tight, limit the free movements of the wearer, and

if not very well shaped will tend to press the arms forward and cause contraction of the chest.

I have already referred to the serious error in construction of these garments, vests and combinations being made the same size across the chest as in the back, tending to force the arms forwards.

If the arms are held back in a good position, with the chest expanded, the measurement across the chest at the shoulders is considerably greater than the measurement across the back, and unless this difference in size is provided for in the vest, the shoulders will be induced to come forwards until the dimensions are equalised, as already explained. Of course this effect is not produced at once, it is a matter of growth and development, a very slight pressure being sufficient to bring about the evil complained of.

I have tried to find ready-made under garments constructed in the proper shape, but have failed in my endeavours, and my patients have had to get them made specially.

The fault can be remedied by inserting a V-shaped piece of flannel into the gap produced in the under-vests when the child's arms are drawn back as far as they will go.

This V-shaped piece can be sewn to the vests on one side, and button-holes made along the other side.

It should always be kept in mind that the chest should have ample freedom for continued development, and especially in cases where the child has worn wrongly-shaped clothes for a considerable time. After the necessary alterations as to shape have been made I have known the chest to increase in circumference two or three inches in the course of a few weeks.

Choice between Vests and Combinations.—The combination of the vest and drawers in one garment doubtless has its advantages, but we must consider the fact that all woollen clothes shrink after being repeatedly washed ; and further, the child may grow more quickly than the garments wear out.[1] When vests and drawers are worn separately, there is some room for shrinking to take place without its producing a downward pressure on the shoulders, a result which very soon occurs in the case of combinations.

Outer Garments.—The principles advocated for the underclothes also apply to the outer garments. A blouse is one of the best outer garments for a girl and should be free at the neck and large in other parts so as not to cripple the movements of the body. All clothes should by preference open down the

[1] There are other materials which are not woollen and which do not shrink, and I think these are better for many reasons.

front, so that any want of room may be detected without difficulty.

Tailors' Clothes.—With boys all the evils already described are perpetuated, or produced, by the tailor. We know as men how difficult it is to get tailors to allow sufficient room across the chest. There seems to be a persistent belief in the minds of tailors' 'cutters' that all shoulders slope downwards, and all chests are flat. I have taken a great deal of trouble to get tailors to alter this plan of construction, and I have more often failed than succeeded. They certainly have this excuse—that the boys they have to make for have generally already been deformed by the clothes previously worn.

The effect produced upon children by altering their clothes in the manner here indicated is very remarkable, and when these alterations are supplemented by a course of systematic exercises to improve the general strength, the results are highly satisfactory both as regards the figure and the general health.

If the tailor and the dressmaker and the manufacturer of ready-made garments would only co-operate in bringing about the proposed reforms, they would do much to improve the physical strength and appearance of the rising generation.

CHAPTER X

STOOPING &c (*continued*)

DIAGNOSIS

UNDER *Causes* (p. 69) some diseases are mentioned which may produce kyphosis, and there are many others which may be accompanied by this condition simply on account of weakness. It would be a great undertaking to discuss the diagnosis of simple postural kyphosis from all these affections; in fact, it would be quite out of place in this small volume.

Various diseases of the nervous system, as, for instance, Friedreich's disease, spastic paralysis, chronic muscular atrophy, and locomotor ataxia, also thoracic and abdominal disorders, are frequently accompanied by stooping, and the surgeon must be ever watchful to form a correct diagnosis.

Upon the other hand, it should be observed that simple postural kyphosis may give rise to functional disturbance of the nerves, which may closely similate central nerve disease, but which will dis-

appear as a result of the practical treatment of the kyphosis.

Caries.—I think it desirable to refer especially to Spinal Caries, because in its early stages this disease may easily be overlooked. When the typical symptoms of caries are present there will not be much difficulty in diagnosing the disease. These symptoms are chiefly pain in the back, abdomen, or legs ; indisposition or inability to stoop, as for instance in picking up some object from the floor; predominance of projection in one or more spinous processes beyond the others ; rigidity of the spine, and great repugnance to twisting movements of the back and to jars and shocks. When, however, any or all of these symptoms are absent, as they may be in caries, as for example when a child with a kyphotic back is apparently simply feeble and extremely sensitive, it is often impossible to form a certain diagnosis. This is a very important matter in respect to treatment, and will be referred to again presently (p. 94).

TREATMENT

If the habit of stooping always received the attention which it deserves and was dealt with energetically in its early stages, many cases of lateral curvature

would be prevented and many others would be brought to light at a much earlier period than commonly happens.

I have already referred (p. 26) to the effect of stooping on the twisting of the spine in lateral curvature, and have urged the importance of drawing the shoulders backwards in treating that deformity, and it will be easily realised that the means that are successful in the combined deformity will act beneficially when stooping exists alone.

MUSCULAR EXERCISES

Exercises are of great value in the treatment of stooping. A course of the general exercises (described on p. 15 *et seq.*) should be given by a skilled teacher. The exercises which develop the muscles of the upper part of the back and of the neck, and breathing exercises, are particularly effective.

In slight cases the surgeon may select a few of these exercises which the patient can carry out under the supervision of a governess or some member of the household, and he can try the effect for a few weeks. This treatment will be much more beneficial if a prone couch be regularly used.

If the patient is old enough, or rather intelligent

enough, to be trusted to carry out an exercise without supervision, he can try a simple method which is very effective. This plan I devised more especially for adults ; it can be practised very easily and without interfering with the ordinary habits of life, and may be described as follows :

A SIMPLE PLAN OF EXERCISES FOR PREVENTING OR CORRECTING STOOPING, AND FOR IMPROVING THE GENERAL PHYSIQUE

The exercises I am about to describe should be practised in the recumbent position, and this can be very conveniently done while the patient is in bed. Ten minutes given to the work morning and night will produce a very remarkable effect, upon anyone, in a few weeks' time. If the bed is used for this purpose the mattress should be a firm one. The pillow or bolster should be very small or removed entirely while the exercises are being carried out. The patient, lying on his back, should stretch himself lengthways as far as possible ; then raise his hands above and behind his head, and grasp the iron or brass rail which usually exists at the head of the bedstead. He should then pull at this rail, not violently but with just effort enough to put the muscles

of his arms and shoulders on the stretch. At the same time he should press his head backwards and downwards on to the small pillow or the mattress. If this action is made correctly he will feel that the muscles at the back of his neck and those between the shoulders are being actively used and the chest expanded.

The effort made should be just sufficient for the performer to feel that he is pulling his shoulders together backwards with a slight strain on the arms. This gentle tension should be kept up as long as possible, that is until a sense of tiredness of the parts is felt. Then the hands should be shifted to a different position wider apart or nearer together, then perhaps to a lower bar, then to the outside vertical bars, the same process of prolonged gentle tension being kept up.

After a few days the patient should increase his efforts not only by prolonging the periods of tension but also by making an effort as if intending to raise the body from the mattress by pushing the head down more firmly and arching the body upwards.

Deep and slow breathing, inspiring through the nostrils and expiring through the mouth, should accompany the other exertions. These exercises do not involve much trouble or great effort, and they are therefore suitable to any person at any age.

They will remove that tendency to stoop which so commonly comes on after middle age, and will improve the general physique, providing always that the clothes worn by the individual are not so made that they have an adverse influence.

Caution with regard to Exercises.—Before prescribing exercises we must consider the difficulty of diagnosing some cases of *caries* in the early stages from simple kyphosis. Unless or until we are certain that incipient caries does not exist, we are not justified in recommending active movements. If a child in whom any of the vertebræ or intervertebral cartilages are affected with tubercular disease be treated by exercises, the disease will rapidly increase, and by the time the disease has become well defined the amount of mischief produced will be, perhaps, irremediable. Upon the other hand, if we treat the case in the first place with a light apparatus, the risk referred to will not be encountered, while the treatment will thoroughly meet the requirements, whatever may be the nature of the case.

MASSAGE

The remarks regarding massage in the treatment of lateral curvature which appear on p. 34 apply equally to the treatment of posterior curvature.

MECHANICAL TREATMENT

If the exercises do not produce a marked improvement in a few weeks' time, or if at any period of treatment the result is not quite satisfactory, the light apparatus already described, or a modification of it with two lighter bars instead of one, should be used.

If a spine has been rounded for several months the bones and cartilages will have become wedge-shaped, the narrow parts being forward towards the centre of the body. If the patient can by an effort hold himself upright for a short time he can only do so by a strain of the joints and a great muscular effort, and it is impossible for him to maintain that position for long because the bones will not be resting flatly upon one another.

Under such circumstances it is useless to tell a child to 'sit up,' for after every effort to do so the spine very soon subsides again; in fact, subsides until the wedge-shaped vertebræ are resting flatly upon one another and the stoop is resumed.

Now the effect of the apparatus is to at once lift up the bent spine and maintain it in such position until the vertebræ (which in a young person are partly cartilaginous) and the intervertebral cartilages have gradually altered their shape to a natural form.

This alteration of shape is certain to take place if the spine is held up continuously whenever the patient is erect. At night when he is recumbent the apparatus may be removed, because although the roundness of the back may temporarily recur to a slight extent yet, the pressure being taken off the bones and joints, no harm will occur.

It is of the greatest importance that this process of straightening of the spine should be effected gradually; in the first place, in order to avoid giving the patient pain, and secondly because if we proceed too quickly we may pull the spine sideways as well as backwards. If we judge by the feelings of the patient at the time of adjustment we shall be safe against too rapid an alteration. The patient in the majority of cases will complain a little of the pressure of the shoulder-straps, but this pressure can always be relieved by his sitting well up in an ordinary square-backed chair with a firm cushion in the lumbar region and with the shoulders *held* backwards, or *reclining* backwards far enough to relieve the pressure of these straps. At any time during treatment the patient, whether sitting or walking, can relieve this pressure by making an effort to hold the shoulders back. This treatment is so far a muscular exercise treatment, and it is desirable

to urge the patient to be frequently making this muscular effort.

It need hardly be remarked that this effort does not do away with the necessity of periodical alterations in the shape of the apparatus. Upon the first occasion of putting on the instrument great care must be taken by the surgeon, as just stated, not to do too much. The patient should feel comfortable, but it will be necessary to readjust the apparatus the day after the first application, or in some exceptional cases such readjustment may be left till the second day.

The treatment of these cases by means of the apparatus is very satisfactory. A child who has been for months stooping, depressed in spirits, with no appetite, perhaps with a cough or a great tendency to catch cold, and probably suffering from indigestion, will in about a fortnight's time have become upright in posture and so far free from his previous troubles that all doubt will be removed regarding the ultimate success of the treatment.

'**Curling up in bed.**'—Sometimes a patient may have acquired the custom of 'curling himself up' in bed, *i.e.* rounding his back and drawing his knees up towards his abdomen. This position is doubtless a comfortable one when the bones and cartilages or

the cartilages alone have become wedge-shaped, but it must be overcome. Generally after wearing the apparatus for a week or so in the daytime this tendency disappears, but in cases in which the posture seems inclined to persist it is a good plan to let the child wear the instrument all night for about a week, by the end of which time he will probably have overcome the habit.

Chapter XI

THE INFLUENCE OF DIET UPON PHYSICAL DEVELOPMENT

In the preceding pages I have referred more than once to the subject of weakness as a predisposing cause of deformities of the spine ; but I have thought it desirable to reserve for a separate chapter the consideration of the influence of diet in this respect.

I have stated that many cases of curvature follow the diseases of childhood, and under such circumstances we may fairly assume that the result is due to the general bodily weakness, brought about by such diseases. There are, however, a great many instances in which defective vitality exists without any such precursor, and if a child is thus unduly weak it indicates defective nutrition. In other words, we may assume that the diet of such a child has not been sufficiently nutritive.

The period of development of curvatures of the spine is chiefly the period of school life, and there-

fore the remarks I have elsewhere made upon school diet will apply very aptly to the subject under consideration.

In the fourth edition of 'Curvatures of the Spine,' published in 1896, I expressed my opinion upon this subject in the following words: 'There are very few schools in this country where the children are sufficiently well fed to enable them to grow up strongly, let alone to meet the extraordinary strain upon their efforts of development caused by the immense amount of mental work which is thrust upon them. A lack of nitrogenous food, a lack of care and niceness in cooking, a monotonous character of food which dulls the young people's appetites, all combine to bring about this bad effect' (the 'bad effect' referred to being the formation of spinal curvatures from weakness).

The dietary of schools not only fails in the above-named respects, but also as regards the periods between solid meals, to supply the loss of tissues which must take place in the time indicated—that is, from about 2.30 P.M. until about 8 A.M. the following day. The breakfast may be good, the midday dinner may be sufficient, but after that it is quite rare for school authorities to provide any solid meal (I mean good nitrogenous food, such as meat, or even eggs)

until the morning of the next day. Bread and butter, jam, and cakes are not sufficient.

Not only is it customary to leave young growing people this long period without a sufficiency of nutritious food, but it very often happens that they have to work for half an hour or more before breakfast.

As regards the general management of the meals in schools, I will quote part of an article upon this subject which appeared in the *Morning Post* for September 18, 1897. This article referred to my writings on this subject and to a correspondence which had taken place in that newspaper. After discussing the subject generally the writer continued as follows :

'What has been said, and forcibly said, is that in too many instances the supervision is inefficient, that the cooking is bad, that the quality of the viands needs improvement, and that there is not enough variety. In short, as one of our correspondents tersely puts it, some house masters are practical, others are unpractical, and others are "indifferent" —that is to say, "animated by a poor sense of duty." We hope, and would gladly believe, that this last class is in the minority. But, be this as it may, it is nothing short of a public scandal that parents who

pay large fees for the maintenance of their sons should have to supplement those fees by regularly sending hampers of food. Again, the whole principle of extra charges for "relishes" to make up deficiencies in the school breakfasts and teas is vicious and indefensible.'

Subsequently to the appearance of the article which I have quoted, I wrote a letter to the *Morning Post*, which was published in the issue for October 11, 1897, and from which I quote the following:

'As to our public schools, some are fairly good in respect to feeding, others are indifferent, some bad. To one large and important public school my attention has been especially drawn where the routine is said to be as follows: The boys rise at 6.30: in school from seven to eight; go to chapel at eight; get breakfast at 8.30 (this breakfast is said to be good—sausages or eggs, and once a week the luxury of cold meat); dinner at 1.30, to which thirty-five to forty minutes is devoted—beef or mutton, about as often cold as hot, often in the form of hash made up with pickles and other appetisers; but the quality of the meat is said to be very bad, and I have been told upon good authority that during one term the meat had to be sent away from the table four or five times because it was absolutely bad. There is also pudding

provided at this dinner, except once a week in winter, when soup is given, and then the pudding is omitted. Tea is provided at about 6.30, when nothing but tea and bread and butter is supplied by the school. The boys are allowed to provide themselves with extras, and it is not surprising that they choose, as a rule, potted meat or jam. No other meal is given, but the boys can have biscuits and a glass of milk at 9 P.M. if they like.

'It will thus be seen that over eighteen hours elapse between a solid meal (dinner) and the next morning's breakfast of sausages or eggs, with possibly only tea and bread and butter in between. How would any of us feel if we had to get up in the morning, do an hour's work, and then go to chapel, and not get breakfast until two hours after getting up, even when we have had a good dinner the previous evening? For growing boys who have, at the best, had nothing but bread and butter and some potted meat or jam since their midday dinner the day before, this delaying of the breakfast is, I venture to say, most harmful. I do not know how often or how seldom the boys get fresh butcher's meat during the week at this school, but, bearing in mind the tales about hashed dishes, I take it that the dinner often consists of cooked-up food. When such a

state of things exists as I have now described, even if it were only in one public school, there is hardly room for argument as to whether the complaints are reasonable or not. Fortunately there are some masters who take a different view of the requirements of boys, for I know that at one house at least in a very popular school the following dietary exists: For breakfast, chops, eggs and bacon, or fish; dinner, 1.30, of good quality; tea at seven, when the boys can add what they like; and a supper of cold meat. But even here the two hours' waiting before breakfast exists, and the cold meat supper is seldom touched because the meat is said not to be nice.

'Now as to private schools. They differ, of course, immensely, but I will refer to one which is not solitary as regards the poorness of its fare. This is a private school in the Midlands, where there are about fifty pupils at 100*l.* a year each. The pupils have for breakfast bread and butter and tea, and either a very small piece of bacon or a part of a kipper or red herring, not nearly enough in quantity to satisfy the boys' appetites; a biscuit at eleven o'clock; an ordinary midday dinner; and after that nothing but bread and butter for tea, and bread and butter for supper and a glass of milk, which some of the boys

do not care about because they do not seem to digest it. In considering this subject of bread and butter it should be remembered that the butter, a valuable article of diet, is remarkably scanty in most schools. A boy, aged thirteen, who is a pupil at this school, comes home at the end of each term pale, weakly, and requiring the attention of the doctor; but he steadily recovers himself, and gets into a comparatively robust condition, during his holidays, at the end of which he again commences his periods of semi-starvation. Five thousand pounds a year ought to provide better fare, in addition to housing and teaching fifty boys, and leave a fair profit for the master.

'With respect to girls' schools, I think a revelation is in store for many parents when they find out how some of their daughters are treated. Girls are easily led to become enthusiastic in their work, and to think very little regarding healthy habits of life. Nourishing food especially is neglected at the sacrifice of physical strength. I will give an example of a school to which my attention has been called quite recently (1897). This is a school in the South of England under the charge of a religious society. A pupil at this school, a girl of fourteen, is suffering from a very severe (probably incurable) deformity,

developing during recent months, scarcely the result of any other primary cause than general debility. There was no history of severe illness or other debilitating influence until the diet was brought to light. The meals are as follows: Breakfast at a quarter to eight (after half an hour's work), bread and butter and tea, and four days in the week bacon, but this bacon is so bad that the girls can only eat a very little of it—not a third of what they would eat at home. Dinner at 12.30, at which the meat is very often "nearly raw," and the vegetables are said to be so nasty that they are seldom touched. Tea at 5.30, consisting of bread and butter and tea. Supper at eight or 8.15, bread and butter and water; the girls could have milk if they liked. This dietary is obviously not sufficiently nutritious.

'The number of growing girls who suffer from anæmia, weak spines, and hysteria is very large, and I believe that poor feeding is a potent factor in these affections. Hysteria is a subtle disease which has resisted many methods of treatment. One plan, however, has succeeded beyond all others. It consists in excessive feeding and rest, and massage is employed chiefly to enable a greater quantity of nourishment to be absorbed. From the success of this treatment it seems to me a fair inference to

consider that hysteria depends to a great extent upon malnutrition. I do not suggest that children should be fed luxuriously, but that they should be supplied with an ample quantity of nourishing food; properly varied and well prepared, the meals should be at regular intervals and supplied by the school authorities. Home hampers should not be necessary. Among the letters of those few of your correspondents who maintain that boys are excellently fed, there is a remarkable absence of statements as to what meals are supplied, and of what they consist.

'I will now refer to a lecture given by the resident medical officer of Haileybury College upon food in schools. He, at least, is not likely to be prejudiced against the school authorities, and he must have had an excellent opportunity of judging as to the proper diet for the majority. I naturally see the worst of the results of under-feeding, whereas the medical officer of a school will see the general effects. Dr. Savory, to whom I refer, is very much opposed to boys doing work in the morning upon an empty stomach; some food, he thinks, is most essential before lessons commence. He is strongly of opinion that this should be a compulsory meal, and that a boy should have no chance of getting out of it. He considers such early food to be "a meal as to the

necessity for which there is no doubt; a youth has been undergoing a fast from ten to thirteen hours, and has a change from the warm bed to the cold form-room, whilst his bodily temperature is necessarily at the lowest limit." This medical officer has found that the boys are not in favour of this meal; but still he thinks it ought to be enforced, as they would then certainly work better, and "possible fainting in early chapel would be less often heard of." This seems to show that fainting in chapel is comparatively common, and is looked upon by Dr. Savory as a thing to be avoided if possible. My own view is that it is a most serious matter for a boy to faint, and conclusively shows that there is something very wrong about his condition. One such case in school would in my opinion be one too many.'

In more recent years this subject has received attention from various lay as well as medical newspapers and magazines. On April 4 of this year (1903) the *British Medical Journal* published an article, which entirely supported my contention, under the title 'The Food Factor in Education.'

'THE FOOD FACTOR IN EDUCATION

'The attention of the profession, as well as of the public, has latterly been much engaged with the evil effects which appear to result in many cases in young people from what is known as "overpressure."

'In these cases symptoms distinctly referable to the nervous system are those most frequently encountered, but muscular weakness, accompanied by more or less anæmia, is scarcely less common; while a disturbance of the digestive organs is often met with which no care can prevent from constantly recurring, although it may be relieved at the moment by appropriate treatment.

'These troubles are very generally supposed to be entirely due to overstrain of the mental faculties, but it seems desirable to consider whether other causes may not contribute; and whether some part of the evil may not be set down to a diet in which the food is often inadequate both in quantity and quality to supply the requirements of growth, as well as of mental and physical effort. Parents scarcely sufficiently understand that the body is a machine, and that the work done can only be in proportion to the fuel supplied, if the machine itself

is to be kept in anything like working order. For it must be noted that the intellectual output of the child is as much energy produced from the fuel in form of food as the more obvious output of muscular exertion or bodily heat.

'Dr. Collier, at a meeting of headmasters of preparatory schools in December 1901, speaking on the question of the deficiency in growth and weight which had been noted in boys coming to public schools from preparatory schools, said, "It must be remembered that while growth depends upon the proper utilisation of the food taken in from day to day, at the same time all muscular action and brain activity is brought about by the daily consumption of food."

'All authorities write insisting on the absolute necessity for adequate nourishment for school children. Dr. Clement Dukes, the well-known physician to Rugby, and a distinguished authority on school hygiene, states that the average public-school boy requires meat twice a day, and suggests that the innumerable petty misdemeanours of boys may be due to insufficient nourishment.

'Similarly Dr. Newsholme in his valuable book, of which a new edition has just been published, points out that under twenty years of age the chief danger with regard to diet is underfeeding: "For

that the younger an animal the more easily is it starved, and the more actively growing are its organs the more seriously are they injured by partial starvation." He is of opinion (continues the article) that a healthy child's appetite is the best guide to the amount of food required, so long as the food is wholesome. . . .

'. . . . It is not by any means certain that the children of well-to-do, or even of wealthy, parents manage to obtain anything like the quantity of nutritious food necessary to keep them in robust health, though their appetite may be stayed by bread and butter, aided by cakes and sweets openly or surreptitiously obtained. With a view to judging whether such is the case, an attempt has been made to ascertain the number and nature of the meals in various English schools.'

Then follow a series of diet lists, of which I quote one given by Dr. Newsholme:

'TABLE A

'The following table (A) shows the food supplied at two first-class boarding schools for girls, one at the seaside and one in a suburb of London. It may be added that in both cases the fees paid were very high:

as on the mental side, the need for effort has become greater, but the quantity and quality of the food on which this effort is to be sustained remains the same.

'The question for consideration is, whether if we try to drive the engine at a greatly increased speed with the same quantity of fuel serious injury must not inevitably result.

'Warnings are not wanting that something is amiss when medical men meet with a constantly increasing number of adolescents of both sexes who are in delicate health even though not suffering from any definite organic malady. When the rising generation shows a deficiency in stamina it is certainly time to consider what part an insufficient dietary may play in its production.'

The above article so thoroughly expresses the views which I have previously advocated that I will only add that while there can be little doubt that a great many of us, who have attained to or passed the meridian of life, eat to excess of meat and other nitrogenous food, we are apt to debar our children from sufficient nutritious material to adequately build up their rapidly developing tissues.

Chapter XII

DEVELOPMENT OF THE CHEST AND FREE VENTILATION OF THE LUNGS IN PHTHISIS AND OTHER MORBID CONDITIONS OF THE RESPIRATORY CAVITY

One of the most remarkable results of the treatment of lateral curvature of the spine and round shoulders by the mechanical apparatus which I have already described, has been the rapid improvement in general health which has invariably taken place. Such improvement has apparently been the direct result of the development of the thorax and relief of the abdominal compression. No doubt the removal of the strain upon the back, which has previously existed, has helped towards improving the health, but the benefits are undoubtedly chiefly owing to the straightening up of the body, the expansion of the lungs, and the relief of the stomach and bowels from compression.[1] It is this action of expansion of

[1] The good effects of the treatment are also shown in the relief it affords to various and obscure nerve symptoms.

the thorax which is the chief point of difference between the use of Chance's instrument, and all jackets and surgical corsets; and as this effect is brought about without interfering with the action of the muscles, the benefit is attained without any drawbacks. It is for the above reasons not surprising that the use of this apparatus has had so greatly beneficial an effect in all cases of lung trouble, also in some cases of cardiac affection, and in a large number of instances of indigestion and irregularity of the action of the bowels.

The chronic cough of adolescence, the frequency of which was chiefly brought into notice by the late Sir Andrew Clark, has been frequently cured, apparently by the use of this apparatus; chronic bronchitis, and a tendency to coughs, colds, and croup, have repeatedly disappeared directly after treatment of stooping has been commenced by this method. As regards phthisis, I have seen many instances in which the premonitory symptoms of this disease have existed, and have cleared up rapidly under this and general tonic treatment. I shall presently record a few cases in illustration.

The advantages of expansion of the lungs in the treatment of phthisis have long been known, and the

benefit to be derived from pure open air has received special recognition in recent years. If patients suffering from phthisis are improved by breathing in the open air when they can only half-fill their lungs, how much more benefit will they derive when they are able to draw that pure air into the furthermost recesses of the diseased organs.

The following facts may be given as additional reasons for the use of the plan of treatment here advocated.

1. That the deposit of tubercle is more prone to occur at the apices of the lungs than at other parts.

2. That the reason of tubercular deposit occurring firstly in the apices, is the lessened capability of those parts of the lungs to be fully aerated.

3. That this diminished capability for aeration depends upon (*a*) the mechanism of respiration; (*b*) upon the general want of physical strength of the patients, leading to a lessened effort at respiration, and (*c*) a lessened ability to hold the body erect.

4. That all measures which tend to increase the vital capacity of the lungs—such as outdoor occupations and exercises which develop the thorax—tend to lessen the progress of tubercular disease, and even

materially assist to cure that disease when it is dealt with in the early stages.

5. That whatever other remedies may be desirable, the increased aeration of the lungs with pure air is of immense value in the treatment of consumption.

Physicians have aimed at killing the tubercle bacilli, and they have failed. It remains for them, however, to render the soil unfit for the cultivation of those bacilli, or, in other words, to so increase the patient's vitality that tubercle bacilli cannot thrive upon them. To increase the vitality to the greatest extent we have to employ various remedies—climatic, dietetic, medicinal, and hygienic—but of all measures free aeration of the lungs is one of the most important.

THE EFFECTS OF STOOPING UPON THE LUNGS

The stooping attitude prevents the proper action of the ribs, and so lessens thoracic respiration ; in other words, it impedes the breathing to a very serious extent. The abdominal muscles are relaxed, and the power of acting upon the abdominal viscera in the processes of expulsion are interfered with, causing constipation. The chest is invariably flattened or depressed, and the action of the heart, as well as the lungs, interfered with.

The importance to health of free respiration with the power of full expansion of the lungs, has led to the use of the term 'vital capacity.'

The researches of the late Dr. Hutchinson upon the movements of the thorax show conclusively how important it is to maintain a natural 'vital capacity.'

Among many of the valuable facts which he published was that which showed a certain standard of vital capacity for every individual of a similar height, weight, age, and sex. The vital capacity is indicated by the volume of air which can be expelled forcibly from the lungs after a full inspiration. This volume is chiefly influenced by the height. At the middle period of life, the vital capacity *necessary for health* of a person measuring five feet high, is 174 cubic inches, whilst for one of five feet ten inches it is 245 cubic inches, and proportionately according to height, &c. These measurements never vary in perfect health, and therefore, when the amount of respiratory power as thus indicated is diminished, it proves the existence of either distinct disease, or, at least, it shows a lessened vitality.

Dr. Hutchinson also proved, and in fact it is a matter of general observation among medical men, that in people with round ba[illegible] vital capacity is very much lessened. Co[illegible]

diseases are prevalent in children who stoop, and it is very remarkable how such tendency disappears when means are taken to prevent this bad posture. There can be no doubt that individuals thus afflicted are more liable to phthisis than others, and in fact they have a lessened power of resisting an attack of any lung disorder. We, therefore, have excellent reasons for doing all we can to prevent the development of round backs, and all we can to remove them when once established. I have found that by improving the posture, an increase in the circumference of the chest in expansion of from one to three inches has often taken place in a few weeks.

CONTINUED EXPANSION

Dr. Silvester, who, as the author of 'The Physiological Method of Inducing Artificial Respiration,' has a world-wide reputation, recognised the great importance of continued expansion of the thorax. He wrote a pamphlet entitled 'The Physiological Method of Treating Consumption,' in which he urged most strenuously the value of increasing the vital capacity.

THE WEIGHT OF THE ARMS

Dr. Silvester refers to the inability of phthisical patients to use sufficient exertion to fully expand their lungs, and he describes his inquiries as to the weight of the upper extremities. According to experiments carried out for him by the late Mr. John Wood, the average weight of each arm in males was found to be 7 lbs. 7 ozs., and in females 5 lbs. 10 ozs., and when the patient is deficient in strength, the influence of these weights causes a depression of the upper ribs, and materially impedes the aeration of the apices of the lungs. He experimented with the spirometer, and found in a certain number of individuals that with the arms hanging down, the number of cubic inches of inspiration being from 150 to 180, this volume was directly increased to 190 when the arms were supported upwards.

My own observations coincide with those of Dr. Silvester, and I have found that even when the patient retains a comparatively upright posture, the arms tend to slide forwards and depress the thorax, and it will be found that the shoulder blades are then drawn forwards from the central line of the spinal column, as shown in fig. 42, which represents

the shoulders looked at from above downwards; whereas the appearance should be as in fig. 43.

These two figures are copies of sketches which I

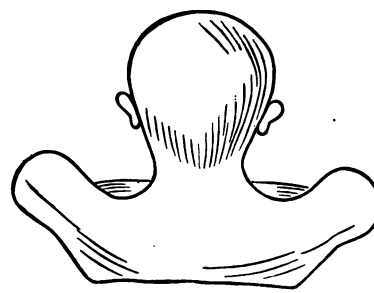


FIG. 42.—Shoulders sloping forwards and chest depressed in a stooping person. Seen from above.

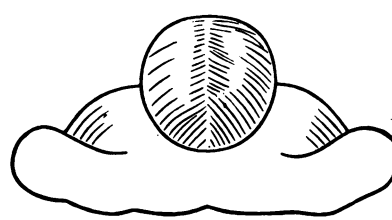


FIG. 43.—Chest expanded by drawing back the shoulders. Seen from above.

made from a patient (fig. 42) before treatment and (fig. 43) after it had been carried out for a few weeks.

Chapter XIII

DEVELOPMENT OF THE CHEST &c. IN PHTHISIS (*continued*)

TREATMENT

DR. SILVESTER'S METHOD

Dr. Silvester, in devising a plan to correct this posture in cases of consumption, advocated the use of a chair with arms sufficiently high to allow the patient to rest his upper extremities, and with a framework above with pulleys for him to exercise his arms held above his head. He also suggested the following plan for supporting the arms in walking. The patient was to stand erect and use two slender poles about six feet long, one in each hand, placed perpendicularly, the lower parts of the poles resting on the ground a little in advance of the heels, when by raising his hands, clasping the pole as high up as he could conveniently reach, the weight of the upper extremities would be borne by the poles instead of

by the patient. Then he was to expand the chest and draw deep inspirations. Silvester remarked that by the free entry of air to the parts affected the tubercular matter might be eliminated, and the site undergo a sort of repair, the cavities gradually contracting, and ultimately becoming obliterated.

COMPARATIVE RESULTS

The results obtained by Silvester were of a very encouraging kind. As far as this treatment went it seems to have been beneficial, but although Silvester's plan effected more thorough aeration than had previously been accomplished in the treatment of phthisical patients, such aeration necessarily continued only for very short periods at a time.

If a patient will rest in a chair with the lumbar part of the back supported, and the shoulders thrown back and the elbows resting upon very high arms, the chest may undoubtedly be placed in a good position, but for how long a time is this likely to be maintained?

Whenever the patient moves, either stands up, or does anything else but sit in that one constrained attitude or supports himself with sticks as

Silvester advised, the chest falls down to its old position. The effect is removed for the time, and there will be very little chance of producing a permanent development of the thoracic cavity.

Then again, as regards exercises, undoubtedly Silvester's method is a good one, and tends to develop the chest; but let us consider the amount of time which a patient can devote to these exercises. Even if the health be comparatively good, he cannot be always sitting in a chair exercising, or walking about with poles to support him, let alone the peculiarity and irksomeness of the occupation, and therefore one cannot expect to obtain more than very limited results.

PHYSICAL WEAKNESS IN PHTHISIS

Another very important point for consideration, is that in cases of phthisis, or where there is a predisposition to this disease, the physical strength of the patient is usually much depressed, so that he is generally unfitted to sustain sufficient physical exertion to efficiently develop the capacity of his lungs. Under such circumstances attempts at corrective gymnastics are distinctly harmful, and the very

gentle exercises which alone will be beneficial to the general health will not be very effective in promoting the development of the thorax.

CONTINUED EXPANSION OF THE THORAX

The plan of treatment which I have carried out with marked success has been the use of the simple apparatus already described for treating cases of lateral curvature and those instances of stooping which resist or are too weak to be treated by exercises alone. It consists in the first place in drawing the shoulders backwards, by the soft shoulder-straps, to the pad placed centrally between the shoulder blades as described on p. 52 and permanently holding them there. There are many so-called *braces* largely advertised in the present day for effecting this purpose. These *braces* pull the shoulders back, and give a false appearance of improvement, but they do nothing to relieve the chest from the weight of the arms themselves. Consequently, we find upon a close examination that the chest is little—if at all—increased in capacity, while there is so much constraint due to the enforced position of the shoulders, that the spine is almost sure to curve in one or other direction. The braces, moreover, tend to pull the

shoulders downwards, and so increase the weight which has to be sustained by the trunk.

My plan consists in keeping the central pad as high as the level of the shoulders, and so producing a somewhat upward support by carrying the light steel rod down the back to the level of the seat, there to be maintained by a pelvic belt.

RESULTS

The results of this treatment have been most satisfactory. The many cases of lung trouble which have thus been cured clearly indicate the benefits which phthisical patients would derive from the method.

Case 1.—Miss L., aged 16, a delicate-looking girl, affected with slight lateral curvature of the spine, had suffered almost from infancy from a succession of colds and coughs. Her mother stated that she had never been free from a cough for more than six weeks at a time, and that as one member of the family had died of consumption, she was getting very anxious as to the future of her daughter's health.

On September 28, 1892, I applied an apparatus. On December 14, 1892, my notes state that since wearing the instrument the patient had been very

decidedly better as regards the tendency to contract colds. She had not had an attack of cough since the appliance was first put on. The spine soon became straight, and the patient was so comfortable, and had derived so much benefit to her general health, that she continued to wear the apparatus.

I saw her on May 3, 1894, and her mother stated that the good effect had continued, and she had not had a cough of the slightest consequence ever since the commencement of the treatment, and that her colds had been only of a trivial nature, and of very rare occurrence.

Case 2.—On May 11, 1886, a young lady, aged 16, was sent to me by Dr. Charles Myers, of Louth. She had been very delicate from the age of four, after measles and dysentery. The weakness increased during the summer of 1885, exaggerated again during the first months of 1886. She had drooped her head forwards during the last three years, the spine curved backwards, the chest was flattened, so that it formed a vertical line with the abdomen. Her appearance was that of a phthisical person ; she was very pale with a hectic blush, and as several members of her family had died of tubercle it was naturally feared that this patient was similarly affected.

She had suffered from almost constant cough during the last two and a half years. Upon percussion I found dulness over the apex of the left lung. There was pain in the region of the eighth, ninth, and tenth dorsal vertebræ, and the seventh projected slightly.

I treated this patient in the manner described above, allowing her to get about as much as she liked.

By gradual adjustment at intervals I brought her into an upright position, care being taken never to cause her any discomfort. Great relief to all the symptoms was experienced almost from the commencement of treatment.

In a week the dulness at the left apex was gone, showing that the air now entered the lung freely. The improvement in the whole health was very rapid ; the cough ceased, pain in the back went away, the appetite improved, and on July 27—less than six weeks from the commencement of treatment—I was able to note, 'No pain, looks better, stouter, and brighter,' in fact, the change in her appearance and health was very remarkable. She has continued to improve, has become stout and robust, and now feels and looks perfectly well.

Case 3.—Another case was that of Miss M. F.,

aged 9, sent to me by the late Mr. T. E. Parsons, of Wimbledon, September, 1885. She had been subject to a spasmodic cough for several years, and could not sit up straight. She had been seen by many eminent physicians, but the exact cause of the cough was obscure. The chest, however, was much contracted, and phthisis was feared.

From the day on which the apparatus was applied this child began to get better, and in a few weeks the cough left her.

I saw this patient in June, 1893; she had grown to be a fine girl, perfectly robust, and her health and figure were excellent.

I could add dozens of similar cases, but I have selected these three because they are typical instances of which I have full records, and because I saw them subsequently (1894), when the good results continued.

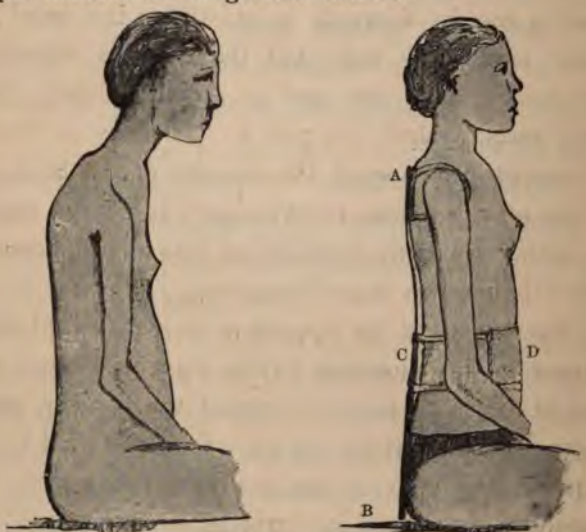
In advocating this plan of treatment I wish it to be thoroughly understood that I am not suggesting it in the place of other measures. We know the value of a combination of remedies to counteract tuberculous disease. To do the best for any patient undoubtedly involves a large amount of trouble and attention. A high and dry locality, residence in the open air, a highly nutritious diet, carefully selected

foods, probably also massage, and various medicinal remedies, are all important, but I would add that until we have mechanically increased the vital capacity of the lungs, and have taken measures to keep the patients in an upright position, with their arms supported without great muscular effort on their part, we have not given these patients the best chance of improving their health, or of recovering from the disease.

Physical Exercise.—The question may still occur to some of my readers—Why not develop the chest by exercises? I have already answered that question, but I will repeat that a great many of the patients are far too feeble to be able to carry out prolonged or systematic movements. If they are strong enough, by all means let them be drilled and taught to take prolonged inspirations, but the effects thus produced will be infinitesimal in comparison with the result of mechanical development. The effect of the latter is *immediate*, is *continuous*, and is without the effort of the patient. The former process is *slow*, is *interrupted*, and is only produced at considerable and generally harmful expenditure of muscular exertion.

The Apparatus which is necessary to carry out this treatment is comparatively light; is felt as a great support and help by the patient; it does not

interfere in the slightest with bodily development; it allows perfect freedom of use to the muscles, and is fully appreciated by the patient on account of the comfort derived from using it, and the immediate and rapid benefits to the general health.



FIGS. 44 and 45.—Patient before and after the application of the apparatus. This apparatus has already been described (p. 52), but for the convenience of the reader I again explain its construction and plan of action.

When the apparatus is applied it has the good effect shown in fig. 45, the chest being expanded and not pressed upon. The supporting bar reaches from the level of the shoulders A, to the seat B, the soft

shoulder-straps act directly backwards, the square pad in the loins C prevents the back from protruding posteriorly, a pelvic belt retains the lower part of the apparatus in position and presses from before backwards. The belt D restrains the abdomen from coming too far forwards in standing; this band is never made very tight, but the body is balanced between it and the pad at C. In sitting, the back rests against the pad C. There is no interference with the use of the muscles of the back, or of any other muscles, but a support is always ready to restrain the body from falling into a bad posture when the muscles cease from acting.

Every part of the apparatus is capable of being altered in any direction by the surgeon himself, so that at each visit for readjustment the surgeon may make several alterations, each of which would have required the help of the instrument-maker if the apparatus had been constructed of rigid steel as usually employed for such purposes.

P.S.—In connection with this subject the importance of removing adenoid growths and hypertrophied tonsils to allow freedom to the respiration, should not be overlooked.

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FIG. 23.—From a photograph of the legs before operation; the left foot is being pressed upwards at the base of the toes.

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FIG. 26.—The feet a few weeks after operation.

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